

In perspective: Wireless, out of the wilderness

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There are numerous laws that affect the technology industry. Some, like Moore's Law¹ and Bell's Law² are discovered through scientific research. Others, like the Digital Millennium Copyright Act and the CAN-SPAM Act are legislative creations. There is another, less formally codified but no less important, law called the "law of unintended consequences" which significantly impacts the technology industry and its innovations. Federal land use policy, most notably the creation of wilderness and wilderness study areas, is guilty of violating the law of unintended consequences. The net effect will be the inability to create sufficient infrastructure for widespread deployment of wireless applications and its attendant benefits.

It's no secret that Internet-based technologies are shaping up to be a key part of solving an array of challenges. Indeed, these technologies are maturing in the natural resources management space. This is especially true in the western United States where there are significant timber, oil, gas and mineral interests seeking new and innovated ways to work cooperatively with responsible environmental interests. To meet this goal, the stakeholders rely on the most novel natural resource applications. These applications require high speed Internet connections. Examples of leading edge technologies include tiny sensors that can be attached to trees to monitor health of forests to aid in firefighting. Also, there are technologies that can be utilized in remote areas to gather real time data on the state of existing and potential mineral resources. These and other utilizations that are best suited to where the resources most readily exist - in the West. This is where the wireless infrastructure becomes critical. The geography and sparse population in the West makes it difficult to establish traditional broadband. All is not lost as there are major wireless platforms that would be best suited to meet needs - WiFi, ZigBee and WiMax. The public policy inflection point is that these platforms need antennas (primary and relay) spread out across key spots.

One policy component working in contravention to the creation of wireless infrastructure is the continued creation of wilderness and wilderness study areas. Haphazard designation of wilderness can inhibit the deployment of these technologies to rural communities and the industries that serve them. Wilderness policies as they currently exist lock up the lands necessary to site the towers and antennas necessary to operate the various wireless technologies.

The technologies and potential applications

To better understand the interaction between wireless technologies and wilderness designations, it is important to get some basics on some of the wireless technologies.

¹ Moore's Law states that the doubling of transistors per square inch on integrated circuits will occur every 18 months.

² Bell's Law states in part that technology advances in semiconductors, storage, user interface and networking enable a new computer class to form every decade.

WiFi (short for wireless fidelity) uses lower frequency spectrum to transmit data from a central antenna (or base station) to one of any number of receivers capable of making a connection with the base station. WiFi is capable of transmitting data up to several hundred feet and can connect computers to each other, to the Internet, and to wired networks. WiMax uses the same antenna and receiver model as WiFi, but is capable of a range of 25 to 30 miles. ZigBee is a technology that uses wireless frequencies to coordinate communication among any number of small sensors. These technologies are not science fiction. Major companies such as Intel, Motorola, Nokia, Honeywell are investing significant resources in developing standards and products.

There are endless applications for these technologies in the natural resource management space. In a possible forest application, ZigBee sensors can be programmed to track heat, moisture and soil quality. These sensors can be placed among any number of trees within critical stands within a forest and connected through the sensor's radio transmitters. The ZigBee sensors can use WiFi to send data about the trees to handheld or stationary PCs near the stands or can use WiMax to send data to central monitoring stations several miles away. The ability to capture real time data would make problem identification, such as which trees are at risk for fire, much easier. Clearly, this would reduce the risk of catastrophic wildfires.

In the mining, oil and gas contexts, exploration teams could collect geospatial and other data from the field and transmit it via WiMax to centrally located coordination teams which could then forward GIS and other data back to the teams to assist them in locating the most productive sites. Once the production starts, ZigBee sensors could be used to constantly monitor soil quality and other environmental factors while providing interested parties with real-time accurate data. This could reduce the instances of costly mine or well closures and cleanups. The net result is that these resources can continued to be developed in an intelligent way thus supporting the goals of a national energy policy that “plans for the future, but meets the needs of today” as articulated by the President.

Apart from the natural resource applications, any business or home can utilize these technologies to access the Internet. This is especially important in Western rural areas that are seeking new ways to attract and maintain economic growth, but are underserved by traditional broadband.

The wilderness factor

Areas designated as wilderness or wilderness study areas are included within the National Wilderness Preservation System (NWPS). The NWPS currently contains 662 wilderness areas covering over 105 million acres. These lands exist primarily in states west of the Rocky Mountains. Designated wilderness areas are to be managed by the various responsible agencies to protect their undeveloped or roadless nature. The law which governs use of NWPS units, the Wilderness Act, prevents commercial activities as well as permanent roads and facilities. Exceptions have been made for administrative requirements and health and safety reasons. Although there are special provisions for fire prevention and the exercising of valid mineral claims under specific circumstances (i.e.

where use has already become established, or land under the jurisdiction of one agency over another; as is the case where U.S. Forest Service is the only agency permitted to conduct mineral prospecting within wilderness), there is no provision that allows for the construction of the technology infrastructure. This construction would arguably be classified as a “commercial enterprise,” and surely would result in “a structure or installation,” which are prohibited under the Act.

Unfortunately, it is on these federal lands within the Western states where many of the wireless solutions could be best applied. As stated above, these states have great expanses of land and sparsely populated areas. These are factors that make traditional broadband (e.g., cable which may not have been converted to handle high speed broadband or DSL which needs a central switch every 3 miles) unattractive economic options.

Despite the obvious benefits of wireless technologies, there are some who vehemently oppose the construction of towers on any type of federal lands, especially wilderness. Environmental groups such as Public Employees for Environmental Responsibility (PEER) suggest that the federal government has “abrogated its responsibility to ... [p]reclude cell phone coverage in wilderness areas.” They wonder “[h]ow can one commune with nature when you cannot escape ‘the calling area’ of civilization?”³ This is a short sighted view to say the least. Most towers used for WiFi and WiMax range between 75 to 150 feet in height, making them relatively unobtrusive. Furthermore, WiMax needs far fewer towers than WiFi because the standard upon which it is predicated (802.16a) uses sub 11GHz spectrum that yields a greater range. However, even though WiMax can utilize non-line of sight receivers typically mounted on homes, the West's sparse population and rugged geography will make some tower construction necessary.

What can be done?

There is no doubt that wilderness designation has a proper place in land use policy. However, before additional wilderness or wilderness study areas are created, there needs to be a complete discussion that takes into account the impacts on all industries. Since these designations will change the way technology is set out, the effects should be considered in the same way the impacts are assessed for grazing, timber, and recreation. Further, there should be a resistance to add additional lands into the NWPS if it would create a disincentive to deploy wireless technologies. If lands must be included, include tower construction and maintenance as an exception in the list of limitations of commercial activities prohibited in wilderness areas. Criteria for environmentally sound construction would necessarily be developed and required. One such criterion should be a realistic cost benefit analysis that captures the measurable benefits of wireless broadband against the measurable impact to wilderness. A final thought; Internet connectivity is fast becoming a necessity. Thus, the importance of its continued

³ PEER Press Release, “Can you hear me now? Cell Towers Spreading Throughout National Park System.” April 8, 2004.

deployment in rural areas, whether for natural resource management or to just get more people online, should not be underestimated.